

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-010896

(43)Date of publication of application : 16.01.1996

(51)Int.Cl.

B22C 1/22

C04B 26/02

C04B 41/48

C08L 61/06

1, 2, 6, 8-13
103

(21)Application number : 06-140433

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(22)Date of filing : 22.06.1994

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(54) RESIN COATED SAND

(57)Abstract:

PURPOSE: To obtain resin coated sand which imparts an excellent parting property to molded goods at the time of molding without degrading their strength by coating the sand by using a compsn. consisting of a phenolic resin and a thermoplastic resin specified in melt viscosity and compatibility with a phenolic resin.

CONSTITUTION: The sand is coated by using 1 to 10 pts.wt. phenolic resin, 0.1 to 4 pts. wt. thermoplastic resin having a melt viscosity of <100 poises at 150°C and ≤20% compatibility with the phenolic resin per 100 pts. wt. sand. The phenolic resin includes novolak type phenolic resins and resol type phenolic resins. The thermoplastic resin includes low-molecular polystyrene, petroleum resins, cumaron-indene resins, etc., the workability at the time of taking out the molded goods obt'd. in such a manner is improved by using such resin coated sand.

claims 1, 8, 6 (exemplary), 8, 9, 10, 11, 12, 13

LEGAL STATUS

[Date of request for examination] 21.12.2000

[Date of sending the examiner's decision of rejection] 19.03.2002

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

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CLAIMS

[Claim(s)]

[Claim 1] Resin covering sand with which the melt viscosity in 150 degrees C comes to cover sand with the phenol resin constituent with which the compatibility with the phenol resin in 150 degrees C made 20% or less of thermoplastics contain one to 50% of the weight by less than 100poise.

[Claim 2] Resin covering sand with which compatibility with phenol resin [in / in the melt viscosity in 150 degrees C / 150 degrees C] comes to carry out melting covering of 20% or less of thermoplastics 0.1 - the 4 weight sections with phenol resin 1 - 10 weight sections by less than 100poise to the sand 100 weight section.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the resin covering sand used for pressing, casting shaping, entrainment shaping, etc. with heating metal mold.

[0002]

[Description of the Prior Art] The sand covered with the phenol resin system binder is used for manufacture of compound building materials etc. as the mold for shell molds, and manufacture and the resin concrete (mortar is included) ingredient of a core. In case these are manufactured, the shaping approach which uses heating metal mold is performed widely. In these manufactures, the attempt which improves a mold-release characteristic with metal mold is made from viewpoints, such as reduction of a percent defective, and workability. For example, in the JP,62-127140,A official report, it has proposed carrying out 0.5-5 weight section combination of ethylene screw stearin acid AMAIDO, the polyethylene wax, etc. to the phenol resin 100 weight section as lubricant. In addition, the approach of applying a release agent to metal mold is also performed. However, the amount is limited in order that the approach of blending lubricant may cause other problems, such as a fall on the strength. The approach of applying a release agent to metal mold needs to perform this frequently, and has a problem in respect of working efficiency.

[0003] Although it is the purpose which reduces thermal expansion, improves reinforcement, or improves heat collapsibility and blending various resin, such as ketone resin and an epoxy resin, with phenol resin is also indicated by JP,56-163055,A, JP,58-58954,A, etc., these do not aim at improvement in a mold-release characteristic. Moreover, although JP,57-153044,A has the publication about the resin concrete of the poly isocyanate system, this is not the thing of a phenol resin system.

[0004]

[Problem(s) to be Solved by the Invention] This invention aims at offering the resin covering sand which gives the mold-release characteristic which was excellent at the time of shaping, without reducing the physical properties of mold goods on the strength.

[0005]

[Means for Solving the Problem] This invention is resin covering sand which comes to cover sand with the phenol resin constituent with which the compatibility with phenol resin [in / at less than 100poise / in the melt viscosity in 150 degrees C / 150 degrees C] made 20% or less of thermoplastics contain one to 50% of the weight, and receives the sand 100 weight section. It is resin covering sand with which the compatibility of phenol resin 1 - 10 weight sections, and phenol resin [in / at less than 100poise / in the melt viscosity in 150 degrees C / 150 degrees C] comes to carry out melting covering of 20% or less of thermoplastics 0.1 - the 4 weight sections.

[0006] The sand used by this invention can mention various kinds of sand, such as quartz sand (for example, No. 3, No. 4, No. 6, No. 7), river sand, sea sand, a crushed stone (2-5mm), and a pumice, and these can be used for it as independent or mixture. Preferably, it is quartz sand.

[0007] The phenol resin used in this invention makes phenols and formaldehyde, such as a phenol,

cresol, and a xylenol, react under existence of a catalyst, and is obtained, and the mixture of the phenol resin which carried out conversion of novolak mold phenol resin, resol mold phenol resin, and these, or these resin etc. is mentioned. These phenol resin is used as the shape of a solid under existence of a curing agent or nonexistence.

[0008] By less than 100poise, as long as compatibility with phenol resin [in / in the melt viscosity in 150 degrees C used in this invention / 150 degrees C] agrees on this condition as 20% or less of thermoplastics, the resin of arbitration can be used, for example, hydrocarbon system oligomer or these copolymers, such as low molecular weight polystyrene, petroleum resin, and cumarone-indene system resin, etc. are mentioned. Preferably, in 150 degrees C, they are phenol resin, and immiscible or the resin oligomer of the hydrocarbon system which is thermoplastics of partial compatibility (5% or less of compatibility), and does not have a polar large functional group.

[0009] In addition, melt viscosity can be measured with a cone plate viscometer. Moreover, the compatibility with phenol resin can be measured by observing the condition of a phase, after putting equivalent mixture into glassware, carrying out melting mixing at 150 degrees C and putting phenol resin and a wax for 120 minutes at this temperature. that is, it is **** in a plane 1 while % of compatibility and a phase have been two about volume x100 of partial compatibility and whole volume/of an intermediate phase in the time of full compatibility (100%) and a phase being three about the time when a phase is transparent at one -- the time of comb ***** is made immiscible (0%).

[0010] As for the blending ratio of coal to the phenol resin of the above-mentioned thermoplastics, it is good that it is the amount of the obtained resin constituent which becomes 3 - 30 % of the weight preferably one to 50% of the weight. moreover, the blending ratio of coal to the sand 100 weight section -- phenol resin 1 - 10 weight sections, and thermoplastics 0.1 - 4 weight sections -- it is preferably good 0.2 - 3 weight section and that it is 0.3 - 2 weight section more preferably. In addition, although the number of phenol resin and thermoplastics one, respectively and two or more sorts are sufficient, in the case of two or more sorts, it calculates in the amount of the sum total. Here, if many [if there are few loadings of thermoplastics, amelioration of a mold-release characteristic is not enough, and /-too], poor kneading will occur, or the hardenability at the time of shaping becomes late.

[0011] Lubricant, such as curing agents, such as a hexamethylenetetramine, and a calcium carbonate, and other additives can be blended with this resin covering sand. This resin covering sand can be manufactured by the HOTTOMA-Ling's method etc. For example, the sand heated at 120-180 degrees C is beforehand put into kneading machines (whirl mixer etc.), specified quantity addition of phenol resin and the thermoplastics is carried out, melting is carried out to this, and it covers. Next, the water in which the hexamethylenetetramine was dissolved as occasion demands is added, and it ventilates further, and lubricant, such as calcium stearate, is discharged after optimum dose addition, and resin covering sand is obtained in the place where the lump of sand collapsed.

[0012] In order to fabricate the resin covering sand of this invention and to manufacture mold goods, such as building materials, the pressing which uses heating metal mold, casting shaping, entrainment shaping, etc. can be applied, and the workability when taking out the obtained mold goods is improved by using the resin covering sand of this invention. Therefore, the time and effort which sprays or applies a release agent to metal mold is reduced sharply.

[0013]

[Example] Hereafter, the example and the example of a comparison of this invention are shown. In addition, evaluation of a mold-release characteristic, strong evaluation, and the fluidity test of resin covering sand were performed by the following approach.

(1) Set the metal mold which has an even front face to the board of the upper and lower sides of the pressing machine heated to the evaluation of 250 degrees C of a mold-release characteristic, only the first time carries out constant-rate spraying of the fluorine system release agent on a metal mold front face, and it is 2 150cm in 100g of resin covering sand to this. It carries quickly so that it may become, and the spacer of 4.5mm thickness is inserted between vertical molds, and it is 20kg/cm2. It fabricates and holds for 60 seconds. Next, ** is opened wide and the mold-release characteristic from a metal mold vertical side is observed. By repeating this, the count which can be continuously fabricated only by

spraying a release agent first is asked for and evaluated. Measurement is performed within the limit of 30 times.

[0014] (2) Slush resin covering sand into the heating metal mold of 250 degrees C of strong evaluations, hold for 2 minutes, after that, remove a mold immediately and create 20kg/cm² of three 150x20x22.5mm test pieces. After cooling this in ordinary temperature and measuring a consistency, flexural strength is measured by loading speed part [for /] and span 100mm. [of 20mm]

[0015] (3) Use the powder-circuit tester made from Fluidity test Hosokawa Micron, and measure the angle of repose of resin covering sand and rough restoration bulk density, and dense restoration bulk density.

α.6 [0016] [Example 1] The quartz-sand (hula tally sand No. 6) 100 weight section is beforehand heated at 160 degrees C. It puts into a Shinagawa style desk mixer. To this The novolak mold phenol resin (S phenol NK8000 by Nippon Steel Chemical Co., Ltd.) 2 weight section of 86 degrees C of softening temperatures, The melt viscosity in 150 degrees C adds the cumarone-indene system resin (Nippon Steel Chemical , Inc. S kuron N-100S) 0.5 weight section as thermoplastics whose compatibility with the novolak mold phenol resin in 12poise and 150 degrees C is 5%, and is mixed to silica sand. Melting is carried out for 60 seconds. Then, the hexa water made to dissolve the hexamethylenetetramine 0.3 weight section in the water 1.5 weight section is added, it ventilates from a blower after 15 seconds, ventilation is suspended in the place where padding of sand collapsed, and the calcium stearate 0.05 weight section is added as lubricant. Sand removal was carried out with the sand temperature of 70-80 degrees C after 30 seconds, and resin covering sand was obtained.

α.6 [0017] [Example 2] Resin covering sand was manufactured and evaluated like the example 1 except the melt viscosity in 150 degrees C having carried out 0.5 weight-section addition of the C5 system petroleum resin (high RETTSU by Mitsui petrochemical incorporated company T-100) whose compatibility with the novolak mold phenol resin in 36poise and 150 degrees C is 0% as thermoplastics.

α.6 [0018] [Example 3] Resin covering sand was manufactured and evaluated like the example 1 except the melt viscosity in 150 degrees C having carried out 0.5 weight section addition of the low molecular weight polystyrene (Mitsuhiro formation incorporated company HAIMA ST95) whose compatibility with the novolak mold phenol resin in 24poise and 150 degrees C is 0% as thermoplastics.

[0019] [Example 4] Resin covering sand was manufactured and evaluated like the example 1 except having made the addition of phenol resin into the 2.375 weight sections, and having made the addition of cumarone-indene system resin (Nippon Steel Chemical , Inc. S kuron N-100S) into the 0.125 weight section for the hexamine as the 0.356 weight section and thermoplastics.

[0020] [Example 5] Resin covering sand was manufactured and evaluated like the example 1 except having made the addition of phenol resin into the 1.5 weight section, and having made the addition of cumarone-indene system resin (Nippon Steel Chemical , Inc. S kuron N-100S) into the 1.0 weight section for the hexamine as the 0.225 weight section and thermoplastics.

[0021] [Example 1 of a comparison] The addition of phenol resin was made into the 2.5 weight sections, the hexamine was made into the 0.375 weight section, and resin covering sand was manufactured and evaluated like the example 1 except having not added thermoplastics.

[0022] [Example 2 of a comparison] Although resin covering sand was manufactured like the example 1 as thermoplastics except having made the addition of cumarone-indene system resin (S kuron by Nippon Steel Chemical Co., Ltd. N-100S) into 6 weight sections, the lump of sand could not collapse easily, generating of a pellet was seen, and physical-properties measurement was not completed.

[0023] [Example 3 of a comparison] Resin covering sand was manufactured and evaluated like the example 1 except the melt viscosity in 150 degrees C having carried out 0.5 weight section attachment of the polystyrene resin (S CHIREN [by Nippon Steel Chemical Co., Ltd.] G-15L) whose compatibility with the novolak mold phenol resin in 1000poise or more (non-melting condition) and 150 degrees C is 0% as thermoplastics.

[0024] [Example 4 of a comparison] Resin covering sand was manufactured and evaluated like the example 1 except the melt viscosity in 150 degrees C having carried out 0.5 weight section addition of

the petroleum resin (Nippon Zeon, Inc. Quinton QTN-1500) whose compatibility with the novolak mold phenol resin in 26poise and 150 degrees C is 100% as thermoplastics.

[0025] [Example 5 of a comparison] Resin covering sand was manufactured and evaluated like the example 1 except having made the addition of phenol resin into the 2.375 weight sections, having made the hexamine into the 0.356 weight section, and having carried out 0.125 weight section addition of the carnauba wax (compatibility with 0.1poise or less of melt viscosity in 150 degrees C and the novolak mold phenol resin in 150 degrees C being 0%) used as a release agent from the former instead of thermoplastics.

[0026] The mold-release characteristic of the examples 1-5 of a comparison, reinforcement, and a fluid evaluation result are shown in Table -1 at examples 1-5 and a list. in addition, the table -1 -- setting -- O -- vertical both sides -- a mold-release characteristic -- it is shown that sufficiency and ** say those [some] with mold release resistance to one side, and x says that a mold-release characteristic is bad. The figure of a mold-release characteristic (time) is a count of shaping from the beginning, and shows the last shaping time from which evaluation of O, **, or x was obtained. Usually, it changes in order of O, **, and x. When x continues twice, measurement is considered as termination.

[0027]

[Table 1]

	熱可塑性樹脂の種類と添加量		成型性(回)			曲げ試験		流動性試験		
	種 類	添加量 (重量部)	○	△	×	試験片 密 度 (g/cm ³)	強 度 (kg/cm ²)	安息角 (度)	粗充填 密 度 (g/cm ³)	密充填 密 度 (g/cm ³)
実施例 1	クロロインデン系樹脂	0.5	10	30	—	1.46	76	20	1.48	1.60
実施例 2	C ₈ 系石油樹脂	0.5	12	30	—	1.41	68	23	1.42	1.57
実施例 3	低分子量的ポリスチレン樹脂	0.5	8	25	—	1.46	68	20	1.47	1.61
実施例 4	クロロインデン系樹脂	0.125	2	8	12	1.47	75	22	1.49	1.61
実施例 5	クロロインデン系樹脂	1.0	30	—	—	1.45	72	20	1.48	1.60
比較例 1	なし	0	0	4	6	1.48	70	23	1.48	1.61
比較例 2	クロロインデン系樹脂	6	混練性不良で、グマが発生し、物性未測定							
比較例 3	ポリスチレン樹脂	0.5	0	4	6	1.45	55	20	1.47	1.60
比較例 4	石油樹脂	0.5	0	4	7	1.46	70	21	1.48	1.61
比較例 5	カルナウバワックス	0.125	30	—	—	1.38	43	20	1.39	1.50

[0028]

[Effect of the Invention] Since according to this invention the mold-release characteristic of mold goods is improved notably and the effectiveness is continued even if it does not spray or apply a release agent to metal mold, workability improves. Moreover, since the dirt of metal mold decreases extremely, the man day of a metal mold polish becomes fewer, and the maintenance of metal mold becomes easy. Furthermore, without reducing the physical properties of mold goods on the strength, the appearance of mold goods is good and it is effective in the outbreak of a percent defective falling sharply.

[Translation done.]